

Effect of an Educational Program for Nurses regarding Errors in Medications Administration for Children

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Abstract

Background: Medication errors can cause significant morbidity and mortality for children who admitted to pediatric and neonatal intensive care units. So, the nurse need to have a broad knowledge about prevention of medication errors in children. **Aim of the study** was to evaluate the effect of an educational program for nurses regarding errors in medications administration for children. **Research design:** A quasi–experimental design was utilized to conduct the study. **Setting:** This study was conducted at inpatient pediatric department, pediatric intensive care unit, neonatal intensive care unit and outpatient pediatric clinic at Benha University Hospital. **Subjects:** Study subjects were consisted of a convenient sample of all nurses (60 nurses) who are responsible for medication administration to children and a convenient sample of all available children (60 child) through the study period for data gathering. **Tools of data collection:** Three tool were used: **Tool I:** A structured interview questionnaire to assess nurses’ knowledge, **Tool II:** Likert type- rating scale to assess nurses’ attitude and **Tool III:** Observation checklists to assess nurses’ practice regarding errors in medication administration for children **Results:** The majority of the studied nurses had satisfactory knowledge and majority of them had positive attitude post program implementation and three quarters of the studied nurses had competent practice post program implementation regarding errors in medication administration for children. **Conclusion:** The educational program for nurses was effective in improving knowledge, attitude and practice regarding errors in medication administration for children. **Recommendations:** Conduct educational programs about errors in medication administration for children based on actual need assessment of the nurses.

Key words: Educational program, Nurses, Medication administration errors, Children

Introduction:

Medication administration is a complex multistep process consists of ordering and prescription, transcribing, dispensing, preparing, administering, and finally observing and documenting side effects. Although many errors arise at the

prescribing stage, some can occur due to pharmacists, nurses, or other staff. Medication administration errors (MAE) may occur any where along this chain and cause an adverse drug event (Odberg et al., 2018).

The incidence of medication errors in sectors such as emergency rooms and Intensive Care Units (ICUs) is higher due to a large number of children. In particular, children who admitted to ICUs receive medications mostly through their veins that often requires calculation of infusion drop rate. On the other hand, these children are mostly in poor condition or unconscious, therefore, there may be more medication errors in such sectors that can have serious consequences (**Kaboodmehri et al., 2019**).

Medication errors are common in pediatric patients; 5% to 27% of all pediatric medication orders result in a medication error for that, medication errors cause significant mortality and morbidity. Pediatric inpatients may have three times more medication errors in comparing with adult inpatients, and these errors are frequently harmful. For children, 1% of all medication errors carry a significant potential for harm, with 0.24% of errors causing actual harm. This may be because that children are at high risk for these errors due in part to the need for weight-based dosing (**Fathy & Kabeel, 2016**).

Potential contributory of medication errors include, frequent use of unlicensed or off-label medicines in NICUs and PICUs (**Nir-Neuman et al., 2018**), which may be associated with one third of preventable ADEs in hospitalized children. Other related factors may include lack of adequate dosing information for children. Also, children in ICUs are often sedated or may be pre-verbal and therefore unable to prevent errors themselves. There is a need for the use of 'high-risk' medications and/or those with narrow therapeutic indices in these settings

(including opioids, benzodiazepines and anticoagulants), which may also be a possible related factor (**Alghamdi et al., 2019**).

Medication errors lead to an increase in the duration of hospitalization and disability and death up to 6.5% of hospital admissions (**Abukhader & Abukhader, 2020**). Reducing errors and adverse events whilst maintaining child's safety is dependent on a precise and timely evaluation of patients and interventions, which includes child's risk assessment for developing inevitable and non- inevitable complications. The process of assessment and evaluation of child's safety risk is often challenging because of the vulnerable nature of acutely or critically ill children combined with the stressful critical care environment (**Shalaby et al., 2018**).

Preventing further mistakes in future and child's safety are the famous benefits about the medication errors. Shortage of nursing staff, errors of timing drugs, the condition of the child, the type of hospital and ward, fear from reporting consequence, threat of management, fear from evaluation score and the lack of knowledge about unit policies are the important factors which are affected the medication errors and refusing to report (**Rodziewicz et al., 2021**).

Nursing professionals are an important barrier in preventing medication administration errors, as they can act in anticipation, identification and prevention of occurrence. Specifically, nurses have a relevant decision-making role in the management of medication errors, either by working directly with children or in the

guidance/supervision of nursing teams. Therefore, it is important to identify nurses' knowledge about these drugs, in order to contribute to making positive and critical decisions in the stages of error prevention (Santos & Farre, 2020).

Continuous nursing training and education have pivotal roles in improving child safety and minimizing medication errors. For instance, it is important to provide robust training approaches (e.g., simulations) and frequent educational programs on common medication errors, and how to avoid them. This would help in improving staff competencies, team-working and communication skills, and would also be a means of staff gaining more self-confidence (Alharbi et al. 2019). Continuous training also helps in minimizing unfamiliarity with medications by healthcare providers (Salami et al. 2019).

Significance of the study

Medication errors can affect the pediatric safety and are more common in children than other populations. Medication errors incidence are 18% of total medical errors, and are considered as one of the top ten causes of deaths (Zein Eldin et al., 2018). In Egypt medication errors occur in 10.5% in pediatric neonates (El-Shazly et al., 2017).

Nursing staff are involved in medication administration more than other health care professionals and are identified as major contributors to errors in medication administration. The lack of pharmacological knowledge is the leading cause of medication errors by nursing staff (Kosari, 2018). Thus, assessing nurses' knowledge,

practice and attitude with regard to medication administration is critical for enhancing children safety in health care systems (Lee, 2017).

Aim of the study:

Evaluate the effect of an educational program for nurses regarding errors in medications administration for children, through:-

1. Assess nurses' knowledge, practice and attitude regarding errors in medications administration for children.
2. Design, implement and evaluate an educational program for nurses regarding errors in medications administration for children.

Research Hypothesis

1. The educational program will improve the nurses' knowledge, practice and attitude regarding errors in medications administration for children.

Subject and Methods

Research design:

A quasi-experimental research design was utilized to conduct the study.

Research Settings:

This study was conducted at inpatient pediatric department, pediatric intensive care unit, neonatal intensive care unit and outpatient pediatric clinic at Benha University Hospital. Inpatient pediatric department was composed of five rooms where each room of them contain four beds (total=20 beds). Pediatric intensive care unit was composed of three rooms where each two rooms contain four beds and one room contain two beds (total= 10 beds) and neonatal intensive care unit was composed of three rooms where each room contain eight

incubators (total=24 incubators). Outpatient pediatric clinic was composed of one room in ground floor (one bed).

Subject:

A convenient sample of all nurses (60) who are responsible for medication administration to children from the previously mentioned settings were included in the study regardless their personal characteristics and willing to participate in the study.

A convenient sample of all available children (60) who were receiving medication regardless their characteristics during the period of the study.

Tools for data collection:

Data was collected through the following three tools:

Tool (I): A structured interview questionnaire format (pre, post and follow up), it was designed by the researcher in the light of relevant references to assess nurses' knowledge regarding errors in medications administration for children, it was written in an Arabic language and it consisted of four parts to gather data in relation to:-

Part (1): Nurses' characteristics, such as: age, gender, years of experience, qualification and job title.

Part (2): Children' characteristics, such as: age, gender, medical diagnosis and rank).

Part (3): Nurses' knowledge regarding medication administration for children, such as: rights, (routes of medication administration, the conditions for a safe storage of the medicine, phases or stage of medication administration and main components for medication order).

Part (4): Nurses' knowledge regarding medication administration errors for children such as: knowledge regarding: sources of errors in steps of medication administration for children, contributing factors for medication preparation errors for children and causes of medication administration errors for children.

Scoring system of nurses' knowledge:

Each question was checked with model key answer and it was scored either; a complete and correct answer was scored (2), incomplete and correct answer was scored (1) and wrong answer or don't know was scored (0). The total score of nurses' knowledge classified as the following: satisfactory knowledge (if the nurse scored more than 85%) and unsatisfactory knowledge (if the nurse scored less than 85%).

Tool (II): Likert type- rating scale, it was designed by the researcher in the light of relevant references to assess nurses' attitude regarding errors in medication administration for children and it consisted of five parts:-

Part (1): Contributing factors of errors in medication administration for children (it consists of 7 elements) personal neglect, heavy workload, unfamiliarity with medication, new staff, complicated doctor-initiated order, unfamiliarity with child's condition and insufficient training.

Part (2): Barriers of reporting errors regarding medication administration for children (it consists of 4 elements) fear factors, managerial factors, reporting errors factors and disagree with definition of medication errors.

Part (3): Facilitators of reporting errors regarding medication administration for children.

Part (4): Approaches recommended to reduce errors regarding medication administration for children.

Part (5): The ways to make medication administration for children safer.

Scoring system of nurses' attitude:

Response of nurses was rated as the following; 1= strongly disagree; 2= disagree; 3= undecided; 4= agree; 5= strongly agree. Total responses of the nurses' attitude was classified in either positive or negative attitude. The total score of nurses' attitude classified as the following: positive attitude (if the nurse scored more than 75%) and negative attitude (if the nurse scored less than 75%).

Tool (III): Observation checklists, it was designed by the researcher in the light of relevant references to assess nurses' practice regarding errors in medication administration for children, and it consisted of five parts as following:

Part (1): Nurses' practice regarding medication rights, (right medication, right dose, right child, right route and right time).

Part (2): Nurses' practice regarding basic infection control and safety regulations for children's medication administration.

Part (3): Nurses' practice regarding medication administration through drug round.

Part (4): Nurses' practice regarding phases or steps of medication administration for children, (prescribing

phase, administration phase and monitoring phase)

Part (5): Nurses' practice regarding routes of medication administration for children: (such as: medication administration through oral route, via gastric tube, through nebulizer and through intravenous route).

Scoring system of nurses' practices:

Each step of actual nurses' practice was checked with observational checklist and it was scored as the following; done completely and correctly was scored (1) and done incorrectly or not done was scored (0). The total scoring of the nurses' practice was classified as the: competent practice (if nurses scored 100%) and incompetent practice (if nurses scored less than 100%).

Tools validity and reliability:

Validity of the tools was checked by a jury of three experts in the pediatric nursing field from faculty of Nursing Benha University to test face and content validity. The experts reviewed the tools for clarity, relevance, comprehensiveness, simplicity and applicability. All their remarks were taken into consideration regarding the format, layout, paraphrasing, consistency, accuracy and relevancy of the tools. Then the final form was used in data collection.

Reliability of the tools was assessed by the researcher for testing the internal consistency of the tools by administering the tools to the same subjects under similar condition using Cronbach's alpha coefficient test. results from repeated testing was compared (test- retest reliability). This turned to be $r = 0.98$ for nurses' knowledge structured interview

schedule questionnaire and $r = 0.99$ for nurses' practice observational checklists, this indicates a high degree of reliability for the study tools.

Ethical considerations

The study was approved by the ethical committee at the Faculty of Nursing, Benha University. The researcher explained the aim of the study to nurses and ensured that participation in the study was voluntary. All collected data would be confidential and would be used for research purposes only. Oral consent was obtained from all nurses before participation in this study and had the right to withdraw at any time from the study without explanation of their reasons. Confidentiality of the gathered data and results were secured.

Pilot study:

Pilot study was carried out including 10% of the total study subjects (6 nurses) to check the clarity, applicability, feasibility of the study tools and to estimate the time needed for each tool. The necessary modifications were done accordingly. No radical modifications were suggested by the jury upon reviewing the study tools, so, nurses included in the pilot study were not excluded from the study.

Field Work:

Field work was carried out through assessment, planning, implementation and evaluation phases. Data collection for this study was conducted for a period of 6 months starting from the first of November 2020 to the end of April 2021 and 3 months for follow up. The data was collected from the previously mentioned setting according to the policy of the study setting. The researcher was available three days/week (Saturday, Tuesday and Thursday) at

morning shift by rotation to collect the data by the previously mentioned tool from 9 A.M to 1 P.M.

Assessment phase:

This phase involved an individual interview with nurses to collect baseline data. The researcher visited Benha University Hospital in Benha city 3 days/week in the morning shift and was implemented according to nurses' physical and mental readiness. Average number collected was 5-6 nurses per day. At the beginning of the interview; the researcher welcomed each nurse, explained the purpose, duration and activities of the study and took written approval from nurses. Also, the data of the studied children receiving medication were collected by the researcher.

The researcher gave the studied nurses a questionnaire for filling it to assess their knowledge and attitude and it took 10-15 minutes for each tool (tool I and tool II). Each nurse was observed individually during their actual practice of procedures to assess their practices by using observational checklists. The average time needed for the completion of observational checklists for each nurse (by the researcher) was between 30-45 minutes.

Planning phase:

Based on baseline data obtained from pre-test assessment and relevant review of literature, the educational program was developed by the researcher in an Arabic language. Different methods of teaching were used as modified lecture, brain storming, demonstration, re-demonstration and group discussion. Suitable teaching

media were used as power point, real equipment as well as booklet to be a guide for the nurses.

Implementation phase:

Program was implemented through (8) sessions. The studied nurses were divided into 8 groups each group consisted of 5-6 nurses, (4) sessions for theoretical part each session consumed 30-90 minutes and (4) sessions for practical part where each session required from 60-90 minutes, 3 days\ week in the morning shift and was implemented according to nurses' physical and mental readiness. Each session included 10 minutes for discussion and feedback. Each session usually started a summary of what has been taught during the previous session and the objectives of the new topics. These sessions were repeated to each group of nurses.

Evaluation and follow up phase:

After the implementation of the educational program the post-test was administered to assess nurses' knowledge, attitude and practices using the same formats of pretest. This help to evaluate the effect of implemented educational program on nurses' performance in relation to medication errors for children. This was done immediately after the implementation of program and three months follow up after the program.

Statistical Design:

The collected data were revised, organized, analyzed and tabulated. The collected data were coded and transformed into specially designed form to be suitable for computer entry process. Data were entered and analyzed using Statistical Package of Social Science (SPSS) version 25 for

windows, running on IBM compatible computer. Software graphics were done by using Microsoft office excel program version 2010. Descriptive statistics were applied (e.g. frequency, percentages, means and standard deviation). Quantitative data was presented by means and standard deviation.

Results:

Table (1): Revealed personal characteristics of the studied nurses, it was evident that less than three quarters (73.7%) of them in the age group of 20 < 25 years ($\bar{x} \pm S.D$ was 22.16 \pm 6.13 years) and less than two thirds (63.3%) of them were females. Concerning nurses' qualification, more than two thirds (68.3%) of them had diploma of technical institute of nursing (5 years). Most (88.3%) of them were staff nurses. Regarding years of nurses' experience, less than half (48.3%) of them had experience from 1 < 5 years ($\bar{x} \pm S.D$ was 1.98 \pm .72).

Table (2): Revealed personal characteristics of the studied children, it was evident that less than half (46.7%) of them were in the age group of 1-3 years ($\bar{x} \pm S.D$ 2.76 \pm 1.212 years), while more than half (58.3%) of them were females. Regarding the medical diagnosis more than one quarter (26.7) of them had medical diagnosis of pneumonia.

Figure (1): Illustrated that, the majority (90.0%) of the studied nurses had unsatisfactory total knowledge regarding medication administration errors for children pre-program implementation. On the other hand, majority (81.7%) and less than three quarters (70.0%) of them had satisfactory knowledge post and follow up program implementation respectively.

Figure (2): Illustrated that, less than half (48.3%) of the studied nurses had negative attitude regarding medication administration errors for children pre-program implementation. while, the majority (95.0%) and more than three quarters (78.3%) of them had positive attitude post and follow up program implementation respectively.

Figure (3): Illustrated that, most (86.7%) of the studied nurses had incompetent practice regarding medication administration for

children pre-program implementation. On the other hand, three quarters (75.0%) and less than two thirds (60.0%) of them had competent practice post and follow up program implementation respectively.

Table (3): This table demonstrated that there was positive correlation between nurses' total knowledge, attitude and practice regarding errors in medication administration for children pre-program, post program and follow up program implementation.

Table (1): Percentage distribution of the studied nurses regarding their personal characteristics (n=60)

Nurses' characteristics	No.	%
Age/ years		
▪ 18 < 20	3	5.0
▪ 20 < 25	44	73.3
▪ 25 < 30	10	16.7
▪ 30 < 35	3	5.0
$\bar{x} \pm S.D$ 22.16 ± 6.13		
Gender		
▪ Male	22	36.7
▪ Female	38	63.3
Qualification level		
▪ Diploma of nursing school (3 years)	17	28.3
▪ Diploma of technical institute of nursing (5 years)	41	68.3
▪ Bachelor in nursing science	2	3.3
Job title		
▪ Staff nurse	53	88.3
▪ Head nurse	6	10.0
▪ Unit supervisor	1	1.7
Years of nurses' experience		
▪ < one year	16	26.7
▪ 1 < 5	29	48.3
▪ 5 < 10	15	25.0
$\bar{x} \pm S.D$ 1.98 ± .72		

Table (2): Frequency distribution of the studied children according to their personal characteristics (n=60)

Items	No.	%
Age		
▪ Less than one month	10	16.7
▪ One month < one year	12	20.0
▪ 1 < 3 years	28	46.7
▪ 3 < 6 years	4	6.7
▪ 6 < 9 years	4	6.7
▪ 9 < 12 years	2	3.3
$\bar{x} \pm S.D$ 2.76 ± 1.212		
Gender		
▪ Male	25	41.7
▪ Female	35	58.3
Rank		
▪ The first	32	53.3
▪ The second	20	33.3
▪ The third	8	13.3
Medical diagnosis		
▪ Diabetic ketoacidosis	5	8.3
▪ Jaundice	4	6.7
▪ Bronchial asthma	9	15.0
▪ Respiratory distress syndrome	14	23.3
▪ Pneumonia	16	26.7
▪ Intraventricular hemorrhage (IVH)	2	3.3
▪ Hypertension	2	3.3
▪ Covid 19	1	1.7
▪ Gastroenteritis	7	11.7

Figure (1): Percentage distribution of the studied nurses regarding their total knowledge about medication administration errors for children pre, post and follow up program implementation (n= 60).

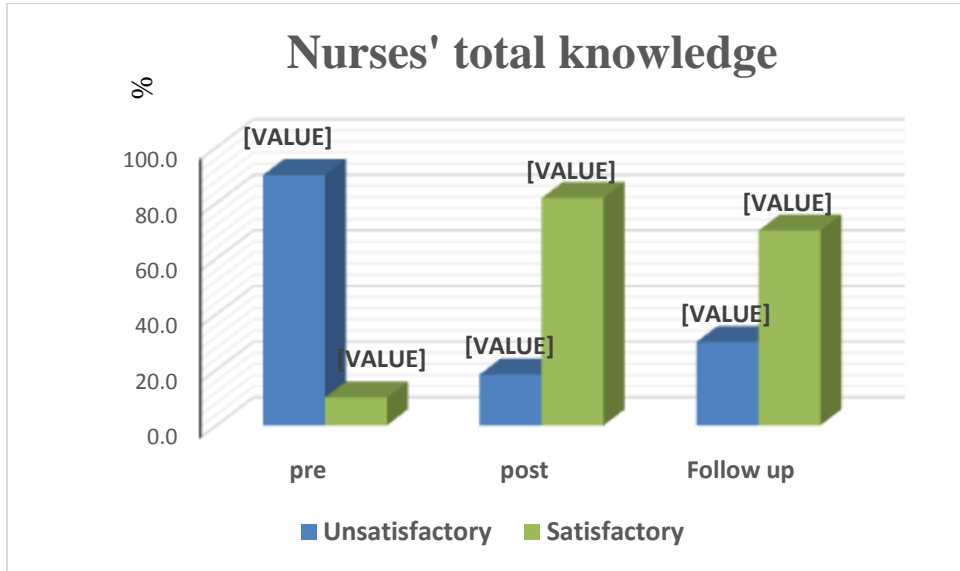


Figure (2): Percentage distribution of the studied nurses regarding their total attitude about medication administration errors for children pre, post and follow up program implementation (n= 60).

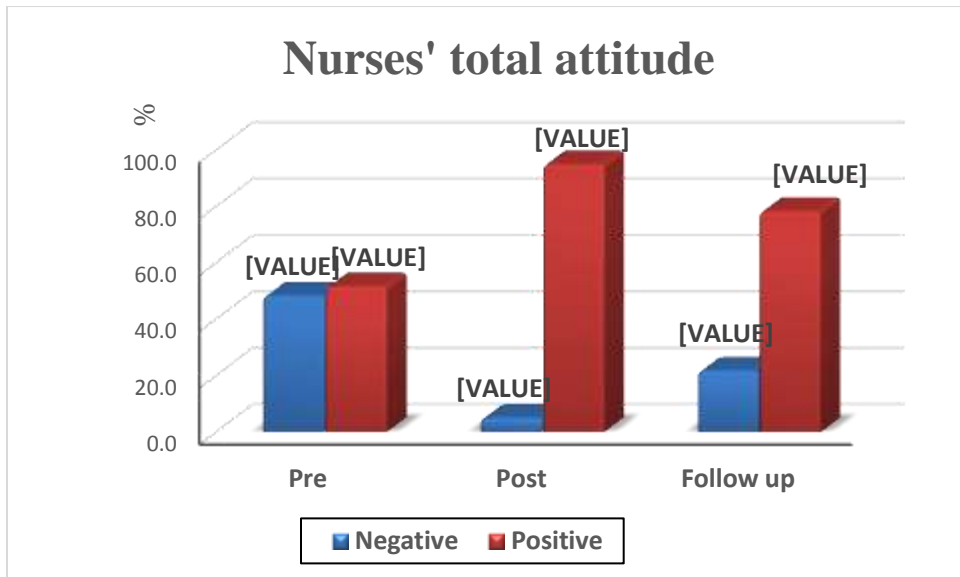


Figure (3): Percentage distribution of the studied nurses regarding their total practice about errors in medication administration for children pre, post and follow up program implementation (n= 60).

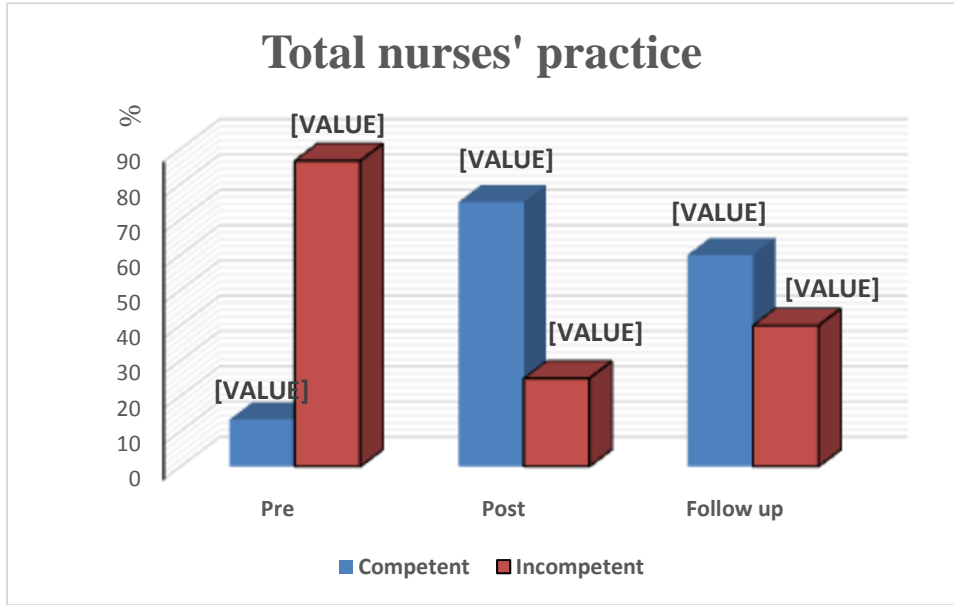


Table (3): Correlation between total knowledge, attitude and practices among the studied nurses pre, post and follow up educational program implementation (n=60).

Variables r/p value		Pre-program implementation			Post program implementation			Follow up of program		
		Total knowledge	Total attitude	Total practices	Total knowledge	Total attitude	Total practices	Total knowledge	Total attitude	Total practices
Total knowledge	r	1	.861	.319	1	.641	.704	1	.445	.508
	p-value	-	.023*	.031*	-	.004*	.018*	-	.000**	.000**
Total attitude	r	.861	1	.312	.641	1	.463	.445	1	.603
	p-value	.023*	-	.015*	.004*	-	.000**	.000**	-	.000**
Total practices	r	.319	.312	1	.704	.463	1	.508	.603	1
	p-value	.031*	.015*	-	.018*	.000**	-	.000**	.000**	-

A highly statistical significant difference ($P \leq 0.001^{**}$)

Statistical significant difference ($P \leq 0.05^{*}$)

Discussion:

Medication administration is a daily basic activity in nursing practice. So, the nurses need to have sufficient knowledge, attitude and competency to perform these tasks (**Mahmood & Hassan, 2020**). Failure at any step can result in a chain of adverse events to the children and increases the child's morbidity and mortality rates. Medication errors are a major cause for serious adverse events, also, can occur during any stage starting from writing the drug order, transcribing the order, dispensing the drug, drug administration, and monitoring. All professionals in the health-care team have a responsibility toward identification of the factors that may contribute to any medication error in children (**Abuelsoud, 2019**).

The present study aimed to evaluate the effect of an educational program for nurses regarding errors in medications administration for children.

According to characteristics of the studied nurses (table 1), it was evident that less than three quarters of them were in the age group of $20 < 25$ years. These findings were in an agreement with **Ltheeth & Abbas, (2017)** who conducted a study about "Effectiveness of an educational program on nurses' knowledge concerning medication error at teaching hospital in AL-Nasiriyah City" and found that the majority of nurses are within the age group of 20 - 25 years. This finding may be due to the appointment of new staff is usually from the newly graduated nurses each year in the hospital.

The current study showed that less than two thirds of nurses were females, these result were disagree with **Fathi et al.,**

(2014) who conducted a study about "Survey of medication error by nurses' self-report in intensive care unit of Imam Khomeini hospital-Tehran" and showed that 83.3% of the participants were females. This could be due to that male were not allowed to be enrolled in nursing faculty at Egypt.

Concerning qualification of the studied nurses, more than two thirds of them had diploma of technical institute of nursing (5 years) and more than one quarter of them had diploma of nursing school. This result was consistent with **Zakria & Mohamed, (2017)** who conducted a study about "Safety intervention educational program to reduce medication administration errors and interruptions" and found that, vast majority of nurses (93.75%) had diploma in nursing. On the other hand, this result disagreed with **Shahin, (2019)** who conducted a study about "Improving intravenous medication administration and reducing medication errors among critical care nurses at Jordan University Hospital" who revealed that most of nurses held bachelor's degrees (90.8%). This could due to the increase in the number of nursing graduates from nursing schools than from nursing faculty.

As regards years of nurses' experience, less than half of the studied nurses had experience from $1 < 5$ years. This result was agreed with **Zein Eldin et al., (2018)** who conducted a study about "Children medication safety strategies: its effect on reducing medication errors among pediatric nurses" and revealed that more than half of studied nurses had < 5 years of

experience. This result probably due to the young age of the studied nurses.

According to personal characteristics of the studied children (table.2), it was evident that less than half of children in the age group of 1 < 3 years. This result was inconsistent with **Chua et al., (2017)** who conducted a study about “Effects of sharing information on drug administration errors in pediatric wards” and showed that, more than half of children age was ranged between the age of 28 day and 1 year. This could due to medication errors were more prone in this age range and majority of child sample from inpatient department and pediatric intensive care unit.

Concerning nurses’ total knowledge about medication administration errors for children, the majority of the studied nurses had unsatisfactory total knowledge regarding medication administration errors for children pre-program implementation. On the other hand, the majority and less than three quarters of them had satisfactory knowledge post and follow up program implementation respectively. These results were consistent with **Fathy & Kabeel, (2016)** who conducted a study about “Effect of educational clinical guidelines program of medication errors on pediatric nurses' knowledge regarding patient safety” that illustrated, the total level of nurses’ knowledge before the program was low, then immediate after program and one month after program it was increased to moderate and high.

As regards nurses’ total attitude about medication administration errors for children, illustrated that, less than half of the studied nurses had negative attitude pre compared to majority of them had positive attitude post program implementation. This result was disagreed with **Ali et al., (2019)** who conducted a study about “Effect of educational program on nurses' performance regarding children safety measures at Minia” and revealed that, two third of the studied nurses have average attitude in pre/ test. While near to half of them have good attitude in post /test. Moreover, there was a highly statistical significant difference ($P < 0.001$) in studied nurse's total attitude toward children safety at hospital in favor of post /test. From the researcher point of view, this indicated the importance of educational program for improving nurses’ attitude.

Concerning nurses’ total practice about errors in medication administration for children, the most of the studied nurses had incompetent practice pre-program implementation compared to three quarters of them had competent practice post program. These results were same line with **Mahmood & Hassan, (2020)** who conducted a study about “Effectiveness of an educational program on nurse’s knowledge concerning danger of mixing medications in Al-Hussein Teaching Hospital in Al-Muthana Governorate” that showed, the total nurse ’ s practices improvement were occurred due to applying of suggested instructional program. From the researcher point of view, the overall improvement in nurses’ compliance due to

improvement in nurses' knowledge and attitude.

According to correlation between total knowledge, attitude and practices among the studied nurses (table 3), demonstrated that there was positive correlation between nurses' total knowledge, attitude and practice regarding errors in medication administration for children pre-program, post program and follow up program implementation. This result was corresponding with **Fathy et al., (2020)** who reported that there was a measurably statistically significant correlation between nurses' knowledge, practice and attitude regarding medication errors in drug administration.

On the same context, this result was supported by **Abo El-Ata et al., (2019)** who conducted a study about "Nurses' performance regarding administration of inotropic medications for critically ill patients" that revealed there was a profoundly positive correlation between practice and knowledge of nurses and there was an indicative positive correlation between their attitude, knowledge and practice. ($r=0.26$ and p value= 0.02). From the researcher point of view the positive correlation between nurses' total knowledge, attitude and practice could due to improvement in knowledge and practice related to program implementation.

Conclusion:

The educational program for nurses was effective in improving knowledge, attitude and practice regarding errors in medication administration for children.

Recommendation:

1. Conduct educational programs about errors in medication administration for children based on actual need assessment of the nurses
2. Professional supervision of medication administration periodically in hospital for children.
3. Establish a reporting system at hospitals for medication errors detection in children and its reporting.
4. Early detection and monitoring drug administration in children.
5. Comply with policy and regulations of drug administration for children.
6. Future studies of medication errors related to child safety should focus on nurse workloads and knowledge for developing appropriate guidelines to increase nursing professional career development.

Acknowledgements:

We would like to thank all the nurses who participated in the study and staff of the pediatric Unit in Benha University Hospital for their help and cooperation during the study.

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